Does Formalising Psychological Theories Advance Scientific Understanding?

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Building on a case study of a formalised theory in psychology, this paper advances a novel account of the evaluation of degrees of understanding. Central to the account is a new evaluative dimension I call a theory's *grip*, which concerns how tightly a given characterisation of a phenomenon fits with the relevant explanatory theory.

Overview:

Psychology is often said to face a theory crisis, commonly attributed to its reliance on verbal theories rather than formal (mathematical) models. This has motivated recent calls to formalise psychological theories as a promising direction for advancing the field. However, critics argue that lack of formalisation is not a problem in itself: many successful scientific theories are non-formal, and premature formalisation can be counterproductive. This raises a central question: under what conditions can formal modelling in psychology genuinely be of epistemic benefit?

A promising answer appeals to *scientific understanding*. In fact, advocates of formalisation in psychology often claim that formal models enhance our understanding of the target phenomena as well as the relevant theories. However, within these debates, there has been little engagement with the extensive philosophical literature on scientific understanding that has developed over the past two decades. As a result, the notion of understanding invoked in these discussions remains under-theoried, and we are left without a clear account of how and why formal modelling is supposed to improve it.

At the same time, philosophical accounts of scientific understanding have almost without exception *already been focused* on understanding brought about by formal theories (or models). Given this, one may assume that formal modelling is (perhaps tacitly) taken as a *necessary condition* for achieving understanding within the philosophical literature. However, taking Henk de Regt's (2017) seminal account as a backdrop, neither formal modelling nor mathematically described theories are a requirement for achieving genuine scientific understanding.

While there are good reasons for this view, not least of which is that we should aim for our accounts of understanding to be compatible with the scientific practice of most of psychology (which in fact operates primarily with verbal theories), I maintain that the ramifications of such a view have not been sufficiently examined. Namely, de Regt's framework struggles to accommodate the intuition widely shared within the formalisation movement — that formalising psychological theories often advances the quality, or degree, of understanding that the given theories provide. On de Regt's view, the degree of understanding a theory T provides depends solely on the degree of T's intelligibility. However, formalised theories in psychology are often less intelligible to practitioners, and this is widely referenced as the central reason why formal modelling still hast caught on in the field. The problem is not avoided by appeal to other proposed evaluative dimensions of understanding, such as representational accuracy (or depth), since most formalised models of psychological processes are explicitly provisional and not accurate in the relevant sense.

The Aim of the Paper:

The present paper has two central aims:

1. To show why the potential noetic value of formal modelling in psychology cannot be straightforwardly accounted for within existing accounts.

2. To propose a novel evaluative dimension of understanding, sufficient to explain how and why formalising psychological theories may in fact advance scientific understanding of the relevant phenomena.

My Proposal:

In the present paper, I argue that due to the overwhelming focus on already formalised theories within the research on scientific understanding in philosophy, shedding light on the potential noetic value of formalisation efforts in psychology is not at all straightforward. Thus, I take a reverse route: I argue that practices and insights associated with the formalisation movement in psychology could instead productively inform our philosophical accounts of scientific understanding. In a nutshell, drawing on a case example of a formalised theory in psychology, I introduce a novel evaluative criterion of scientific understanding I call a theory's *Grip*.

The case example I discuss is the influential *regulatory resource theory* in psychology. Recently, van Dongen et al. (2025), forcefully addressed a crucial flaw of the theory that is characteristic of much of the psychological science — namely, that it is not clear what exactly the theory is supposed to predict. Since it leaves many crucial experimental assumptions underspecified, the authors remark that the theory's predictions "depend on how an individual researcher fills in the gaps and vagaries with their unstated personal assumptions and mental simulations". This is evidenced by the fact that, during the most recent multi-lab replication attempt of the resource theory, *researchers had to consult the original authors*, as key details needed to experimentally test the theory were unclear from the original papers themselves.

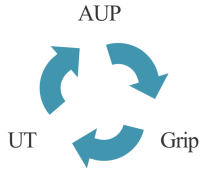
Based on this case example and van Dongen and coworkers' formal model of the regulatory resource theory, I argue that formalising a verbal theory may contribute to the following three mutually reinforcing factors:

(i) **Understanding the theory** (UT): gaining a clearer understanding of what the theory precisely implies.

(ii) **Antecedent understanding of the phenomenon** (AUP): gaining a clearer understanding of what the phenomenon to be explained is in the first place.

(iii) **Grip:** gaining a clearer grasp of how the theory constrains theoretical expectations about the given phenomenon.

On the view I propose, the degree of understanding a theory affords depends jointly on its degree of intelligibility and on the degree of grip a researcher has on the target phenomenon on the basis of that theory. The central advantage of



this approach is that formalisation is treated as a *tool* rather than as a necessary condition for understanding. The account developed in this paper does justice to ongoing efforts to formalise theories in psychology and represents a fruitful addition to de Regt's original pragmatic and anti-realist-friendly account of scientific understanding.

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